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The Art of Armadillo Lizards (*Cordylus cataphractus*): Fifteen Years of Captive Observations

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This article is a look back at my personal experiences over the past fifteen years during which I have been keeping and breeding armadillo lizards, *Cordylus cataphractus*. For you scientific types, I'm afraid this will all be hearsay and anecdotal. Written reports on these little beasts are few and far between. As far as the general population is concerned, many people might not even know that armadillo lizards exist. Even in this day and age of Internet knowledge, no one in America seems to have written any definitive article on the armadillo lizard. After years of waiting for someone else to do it, I have finally decided to do it myself. Here within these pages should be everything you ever wanted to know about *Cordylus cataphractus*, as my life and theirs have been forever intertwined into one. Let's start back at the beginning, shall we?

For me, the odyssey began back in 1985, in the pages of a small book called *Lizards in Captivity* by Richard H. Wynne, under the chapter for Cordylidae. There on pages 104–105 was a short paragraph describing the armadillo lizard and its basic needs in captivity. Of course there were no photographs, just the printed word, leaving the rest to one's imagination.

In August 1985, the Chicago Herpetological Society, which I had just joined that June, would have a speaker who would shed some light on this subject. This was John Visser, a South African wildlife biologist, whose topic was the herpetology of South Africa. His slides at this meeting gave me my first glimpse of an armadillo lizard. To me they looked almost wooden in appearance, their scales hand-carved out of some brown balsa wood, with a triangular shaped head, heavily armored from head to toe. After seeing what these clumsy, comical fellows looked like, I knew I had to obtain a few for my collection.

At this point in the herpetocultural timeline, we had no monthly reptile magazines to look through for animal ads, no monthly reptile shows to buy animals from, and the Internet and personal computers were still in their infancy. We had animal lists, which were mailed out by various dealers throughout the U.S. (less than half a dozen) which, from time to time, might have an animal you might be interested in. One such list from California did offer the aforementioned armadillo lizards for sale. After some hesitance, I called and purchased two. I was keeping primarily geckos at the time, so these were a departure for me into uncharted territory. It was a decision that I have never regretted.

Armadillo lizards occur naturally in South Africa. They are diurnal creatures, reaching an adult size of somewhere between seven to nine inches in length. They live in social groups amongst rocky outcrops, wedging themselves between the cracks and crevices of the rocks, much like a North American chuckwalla does for protection from predators and the elements. These lizards have a long life span—twenty-five years or more. The surrounding temperatures can get very hot in the summer and cold in the winter, when armadillo lizards will naturally hibernate. They can be a light brown to dark brown in coloration and are sometimes referred to with the common name of golden armadillo lizard. The underbelly is yellow with a blackish pattern, especially under the chin. They are one of comparatively few live-bearing lizards—they do not lay eggs like most other lizard species. They are insect eaters and have an interesting defense, in that if frightened, they will grab their tail in their mouth and roll into a ball (Figure 1). This behavior is remarkably like that of the mammalian armadillo, which explains the common English name for these lizards. And just as it does for the mammal, this defensive posture enables the lizard to protect its soft underbelly from predators, exposing only its armored back.

Such was the basic information I had to go on before obtaining my two. When they did arrive, they looked identical in size and shape and I found out that sexing them was somewhat of a mystery.

I housed them in a 30-gallon aquarium with a water dish, hot rock and flat pieces of shale with small rocks glued to the bottom, like little legs, to raise the rock up about one inch from

Figure 1. Armadillo lizards showing typical defense postures. Top photograph by Carlos Sanchez; bottom photograph by the author.

the floor for them to hide under. I used Astroturf on the floor with more pieces of flat shale, which they would utilize for waste elimination. The two animals were fed crickets and given a reptile multi-vitamin powder. During this time I had yet to start using any fluorescent-type lighting, for fear of burning down the house, so they had only natural light from the windows. I kept them like this for over a year with no ill effects. I tried to find a few more to buy after that, but even then they were scarce. South Africa, it seems, was not commercially exporting reptiles into the pet trade anymore; so except for shipments rerouted to be exported from a different country, you didn't see a lot of these animals offered for sale. It wasn't until 1987 that I located three more from a place in Minnesota. When these animals arrived, I placed them in the 30-gallon aquarium with my original two from 1985. After a few days of observation, I learned that my two original lizards were males, something I had suspected all along, since they were identical in body shape and size.

It seems the introduction of the three new lizards caused the two males not to be best buddies anymore and to now look upon each other as rivals. I would notice that one would chase the other inside the aquarium, while the three new ones got along with each other. The new armadillo lizards were also smaller in body weight and had narrower triangular heads than the two larger males. Could it be that these three were all females? Well, that was exactly the situation, as I later found out. I separated the two males, leaving one in the 30-gallon tank with one of the smaller ones and put the other male into a 50-gallon tank with the remaining two. At this time I started using fluorescent lighting, which I would manually turn on and off daily. No further aggression was noted between any of the armadillo lizards. Since no dealers had any *Cordylus cataphractus* to sell, it was at this point that I started placing ads in various regional herpetological society monthly newsletters requesting them. This is how I started obtaining my main collection.

As people responded to my ads, I would buy them one or two at a time, never knowing what sex I was getting, because no one could sex these lizards with any certainty. I'm sure this was part of the reason people were willing to part with them; breeding lizards commercially was just beginning to take off, and people didn't want to deal with an animal they couldn't breed. After seeing a few more armadillo lizards, I determined that females do have smaller, less markedly triangular heads than their male counterparts (Figure 2). Both sexes, however, had femoral pores on the hind legs, thereby confusing a lot of folks who thought they had males because of this feature. They both produce a waxy secretion although it's more prominent in males (Figure 3). I was never one to probe or pop a lizard's hemipenes to determine the sex, as I have heard of too many cases where the final outcome was incorrect. I would then house these animals in groups of one male and two or three females, to the best of my sexing abilities. Extra males would be housed alone, although I have housed a few males together without any ill effect. It all depends on the personality of an individual lizard.

Breeding armadillo lizards, I'd been told, was a daunting task—difficult at best. I decided not to handle them excessively and to keep them as wild as possible. My enclosures were in the living room/dining room area of my house and not in a separate animal room. Soon we tolerated each other's movements. Mine, as I moved through the room so as not to startle them, and theirs, as they made intermittent scuffles that I had to investigate. It took a few months until they felt secure enough to come out from under the rocks to bask under the fluorescent lights. Even then if I walked briskly past, they would all scurry for cover and hide—a domino effect from one cage to the next. It was in 1989 that I experienced my first live birth. It was December and I remember looking into the aquarium and seeing a smaller version of a head peeking out from under a rock. I did not know that the female was even gravid at the time, so it was a complete surprise! To this day after achieving dozens of live births, I still get an adrenaline rush when I look into an enclosure and see a smaller version of an adult basking or looking out from under a rock. The young are identical to the adults, except smaller in size. They are quite large when first

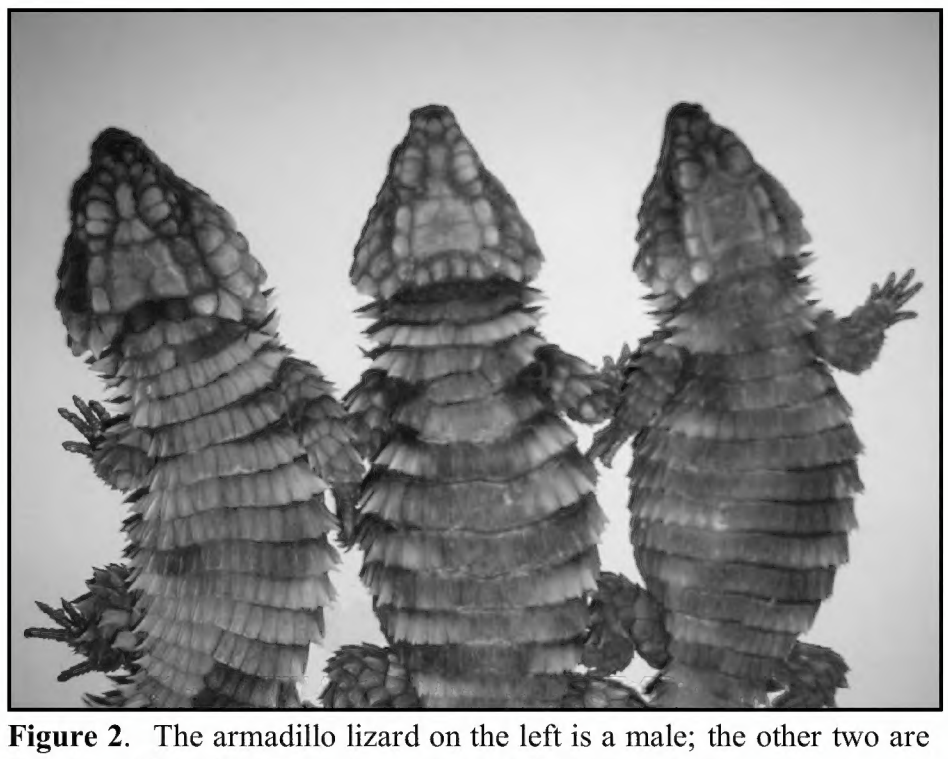

Figure 2. The armadillo lizard on the left is a male; the other two are females. Note the larger triangular head of the male in comparison to both female heads. This is a reliable way to sex these lizards. Photograph by Carlos Sanchez.

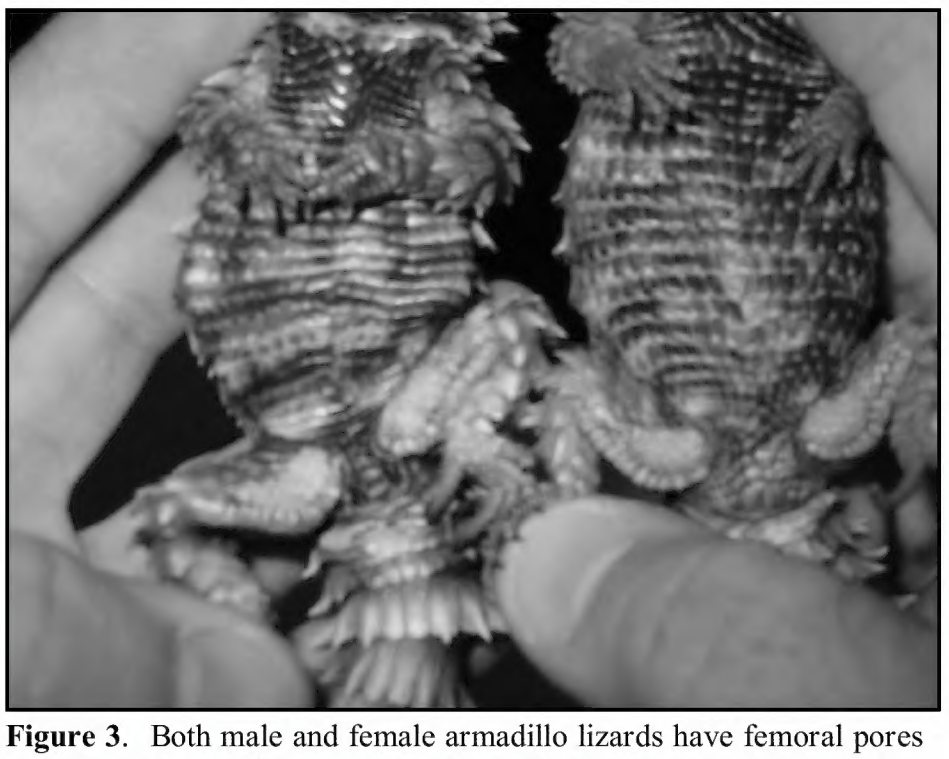

Figure 3. Both male and female armadillo lizards have femoral pores on the hind legs. These are roughly equal between the sexes in size and number. The male is on the left, female on the right. Photograph by Carlos Sanchez.

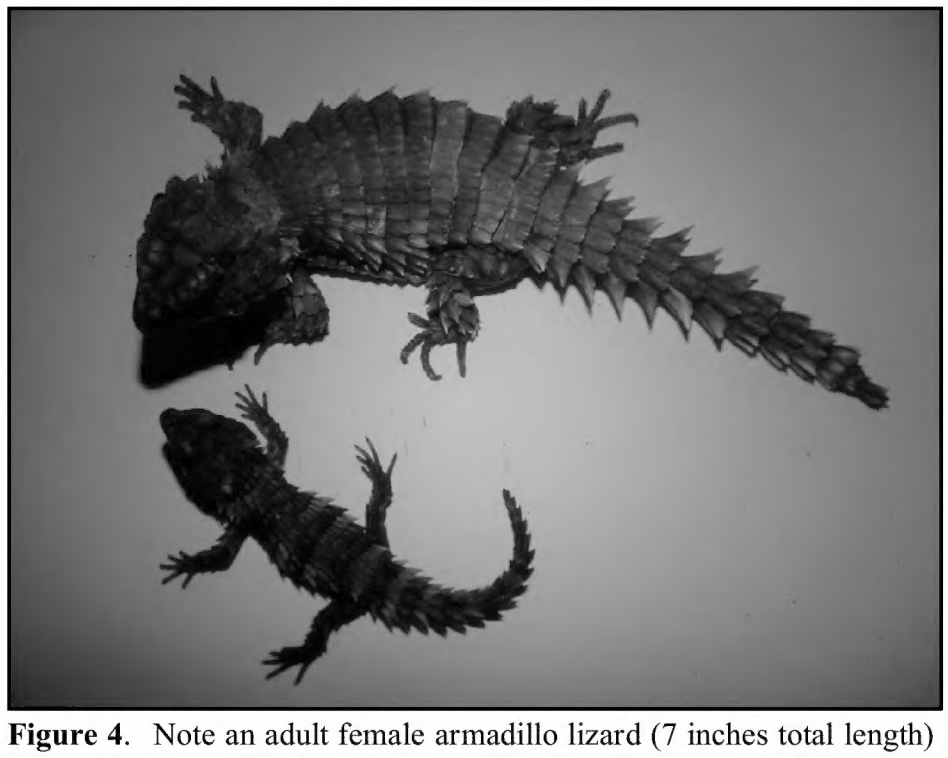

Figure 4. Note an adult female armadillo lizard (7 inches total length) in comparison with a day-old baby. These babies are rather large, compared to other lizards, when first born. Photograph by the author.

born; total length up to 2.5 inches (Figure 4). Although most literature states it can be one or two young, I have never had a female give birth to more than one lizard at a time. And the scientific literature has recently caught up to this fact (see Flemming and Mouton, 2002).

Only once have I actually been able to witness this occurrence of live birth. I was able to photograph the process, but not very well, as it was over in a matter of minutes. I had eight photos left on my roll of film and just enough time to focus and shoot, so of course the photos were over-exposed, but at least I caught the birthing process on film, perhaps for the first time ever for this species. The female came out from under her rocky hiding place into an open area of the enclosure. I knew she was gravid, as she was somewhat swollen on her sides. She just lay there as her sides undulated a bit. She then raised her tail and hind portion and proceeded to give birth. During this time, the lizard would open her mouth as if to utter a silent scream (Figure 5). The baby came out in a thinly membraned embryonic sac. The baby's body was folded

Figure 5. Female *Cordylus cataphractus* giving birth. The baby is folded in half within an embryonic sac. The whole process took less than two minutes. Photograph by the author.

in half inside of this, tip of nose to tip of tail, much like a lizard positioned in an egg would be, except flatter. It then broke the sac and stretched its jaws wide open to get its first breath. The female, having finished the birthing process, scurried off under a rock, and the baby did the same. I was very surprised that the lizard came out into the open to give birth, rather than do so under the cover of a hiding area.

Once a female has given birth, her job is over and the juvenile is on its own. Since 1989, I've produced as few as two to as many as six babies every year. Not every female lizard will always breed from year to year. I've had certain groups stop breeding for as long as a five-year period, then start producing young again after this absence. Breeding season for my captive lizards usually runs from the end of January through March. This is the time that I have noticed the most activity between the sexes, with males actively pursuing females in their attempt to copulate (Figure 6). I have determined that gestation for these lizards must be at least four to six months, since most young are born between September through December.

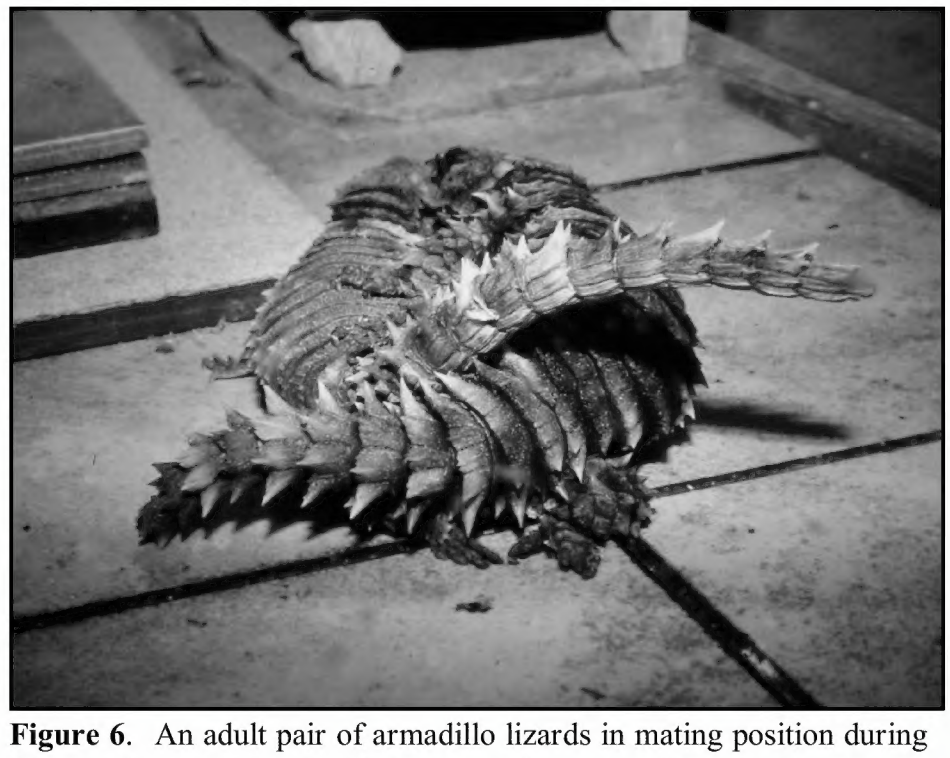

Figure 6. An adult pair of armadillo lizards in mating position during the breeding season. Copulation can take up to a few minutes at most. Photograph by the author.

I have read that these lizards can be cannibalistic towards the young, but I have never seen this to be the case in captivity. There have been many instances where I've found the babies and adults alike, basking on top of one another in harmony. During feeding time when crickets are tossed into the cage, an unforeseen baby lizard will dart out from under a rock, past an adult lizard, to chase down a food item almost as big as he is, in an effort to subdue his prey. Once I find the captive-born baby lizards, I place them in a separate enclosure. Sometimes a baby lizard will not readily eat on its own. If small crickets are ignored, I've found that waxworms will usually be eaten without problems. The advantage of feeding baby armadillo lizards in a group is that when food is offered, a feeding response kicks in and when one lizard begins feeding the others usually will follow suit. Care should be taken to insure that all the lizards are equally fed, so that one individual does not eat most of the food, leaving the others still hungry. I've found that one or two feedings per week is sufficient to ensure good

health for adults, perhaps more for the baby lizards. I also have noticed that these lizards are scavengers, searching the ground for items to consume. This was discovered when I placed a small rubber piece under a rock to help keep it level. One day it disappeared, only to turn up a few days later, partially digested, on the floor of the cage. Some of the lizards were nibbling at the Astroturf also, leading me to believe that they might eat plant material. I experimented with throwing small pieces of kale into the enclosures. The result was that some of the lizards did indeed eat the plant matter. Some, of course, choose to ignore the kale and stick to their insectivorous diet. So some armadillo lizards will accept plants as well as insects for their dietary needs, although I would never recommend a diet of just vegetables for these lizards. Armadillo lizards will also accept small pinkie mice, but I worry that an exclusive diet of these would result in too much dietary protein for the animal. One interesting behavior I have witnessed on more than one occasion, is that of armadillo lizards gnawing on large rocks. They would just try to take a bite out of one, attempting this behavior for a minute or so. Perhaps they are trying to consume rock material to aid in digestion, as some lizards are apt to do. Maybe they are trying to consume rocks for mineral supplement needs, or as part of their daily scavenging routine. I have never witnessed this behavior with any other type of lizard I have kept in captivity.

Armadillo lizards are extremely social animals, living in large groups in the wild. For this reason I raise up each year's babies in a family group, so to speak. Males seem to become sexually active around the third year of maturity. Since I usually house all previous offspring together from each year, they grow up and get along without incidents, usually until this third year. This is when you will notice if more than one male is present in a group, as one will become the dominant alpha-male. Although they live in social groups in the wild, introducing a new lizard into an existing group in captivity may have negative consequences. If a few days after the introduction an animal is constantly chased and harassed, it is best to remove this animal; otherwise it will be bullied to death (Figure 7). I've had instances where I tried to introduce a new female to an existing pair of armadillo lizards, only to have the male constantly pick on the new female. I then tried a different pair only to find that, this time the existing female was the aggressor towards the new female and not the existing male.

Figure 7. An adult male armadillo lizard showing aggression towards another male. Note the open mouth ready to bite, as the other male arches his body in a defensive position. Photograph by the author.

Another example shows that males aren't the only ones who can display aggressive behavior towards a newly introduced animal. I had a group of three females whose male had died, so I wanted to introduce a new male. In the meantime, one of these females had claimed the alpha spot and she would chase the existing females around. The day I introduced a new male, she came charging out to confront him, but he held his ground against her and eventually she went back to submissive from dominant behavior.

Armadillo lizards display the typical lizard communicating skills of head-bobbing, tail-wagging and tongue-flicking, when confronting cagemates or another unfamiliar armadillo lizard. These lizards have very powerful jaws, which can be very hard to open. When they do fight, they can clamp down on legs and toes, biting them off and definitely drawing blood. They can bite down on the sides of the body and start rolling or twisting their opponent's torso. This can cause internal damage to the animal. Although they do not readily bite in captivity, they will sometimes open their mouths to try to bite their tail. I did not witness this behavior until about a year after I had obtained my first two armadillo lizards. I had them both at an educational show, when all of a sudden one just curled up into a ball! Once they do this it is almost impossible to make them let go, until they are good and ready. I have seen them hold this position for almost up to an hour. When it happened the first time, I removed the lizard and placed him into a bag to make him feel secure until he finally let go of his tail. Because of this behavior, armadillo lizards are more reluctant than many other lizard species to dispense with their tails. This is one of the features that drew me to these lizards initially, as most of the geckos I had been keeping previously would drop their tails quite readily. If a portion of an armadillo lizard's tail is lost, the regeneration will occur in segments, much like the original tail. I have individuals who almost never bite their tails, and others who will perform this behavior on cue, should I desire to demonstrate this ability to someone. This is an instinctual behavior, but you certainly do not want to stress out an animal by forcing him to perform this defense over and over.

In the course of keeping armadillo lizards I have gone through various cage incarnations, from aquariums to hand constructed units, which resemble bookcases. Since these lizards are rather clumsy at climbing, my enclosures are all open at the top. The three sides are 12 inches tall laminate board and the front is Plexiglas (Figure 8). As long as no large rocks are placed along the edges, there is no possibility of escapes. Armadillo lizards do like to climb rocks, on top of which they will bask under the lights. My units are five feet long by two feet wide. I use a four-foot fluorescent lighting fixture for each enclosure with one full-spectrum bulb and one blacklight bulb. These fixtures hang twelve inches from the floor of the cage. After years of using these bulbs, I've wondered as to the validity of such lights, since I don't replace them every year. Because the UVB output has surely declined

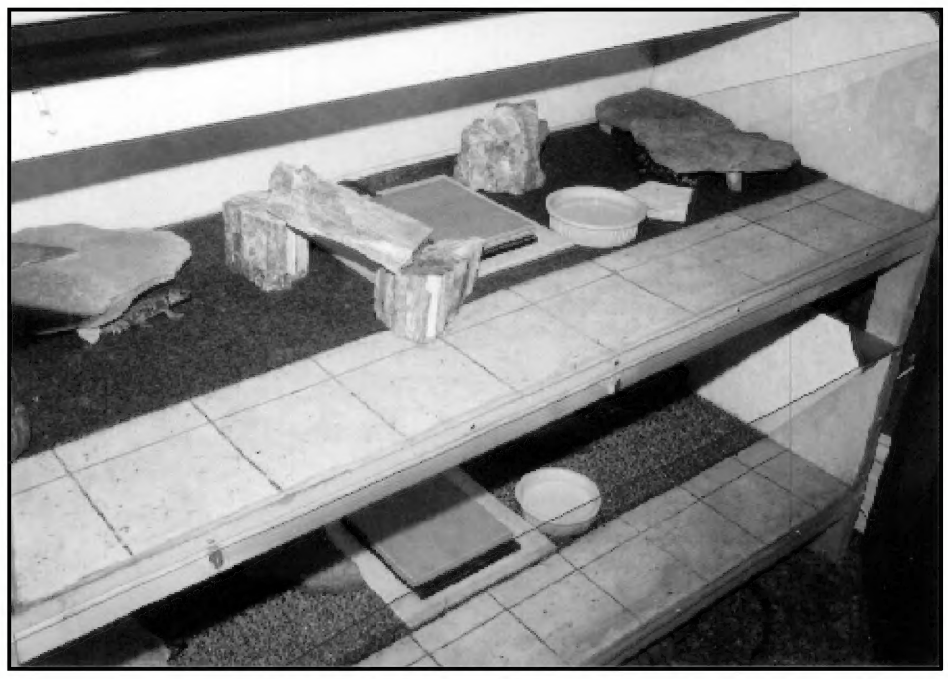

Figure 8. A typical cage enclosure, five feet long by two feet wide, with a Plexiglas front. Photograph by the author.

with the aging of the bulbs, my theory is that these types of lights are more beneficial in triggering a breeding response than with aiding calcium absorption. As long as a vitamin-mineral powder is used and the food items are fed a high calcium diet, I believe that full-spectrum lighting over regular fluorescent lighting does not make a big difference. I have never used a heat lamp since in the summer months it would get too hot, and in the winter months, I prefer to keep these lizards cool, to mimic their natural seasonal change. I utilize a heating pad in each cage, which is turned off during the spring and summer months. I also shorten the timers on the lighting cycle to mimic the natural lighting outside.

I like to keep my cage furnishings simple for cleaning purposes, yet esthetically pleasing. I include several flat rocks for hiding places and various larger rocks for climbing. An Astroturf rug covers most of the floor, except for the front of the enclosure. This whole area I leave exposed for a six-inch width, and this is where the lizards defecate. Since it is right in front for the length of the enclosure, it makes cleaning up on a daily basis extremely easy. I want each enclosure to look the same; I feel that this reduces stress levels should I have to move any animals around. This type of cage design seems to work best for the lizards, as well as my needs. I use a very low, flat, water dish, about an inch in height. This makes it easy for armadillo lizards to drink out of it. If it were much higher, the lizards might not even know it was there. Before I switched to the lower type bowls, I had one lizard that used to lick the side of the water bowl, sensing that water was there, but not possessing the brainpower to approach the dish from the top of the bowl. I have had only one bad experience using a low-sided water bowl. One morning I noticed an object in the water, only to discover that during the evening, a baby armadillo lizard must have been born and wandered into the water by accident and drowned. I had placed a small rock right next to and level to the top of the bowl a few weeks earlier, to aid the lizards in drinking more easily. The end result for me was an accidental death. I hope that such an unfortunate occurrence will never happen to anyone else. Always leave the area around a water dish clear of any objects.

Medical problems have been minimal, but there have been a few that I've encountered throughout the years. Loss of digits is common, as the toes are very small and delicate, and a single bite during mating or fighting can easily amputate one or more. I have several lizards missing various digits, but with no ill effect to the animal. Mouth infections are the most aggravating problem to treat. You can tell if an armadillo lizard has this if, during routine feeding, the animal runs around chasing its prey, but then does not try to bite it. If you look into this animal's mouth and see a white pus-like area, it has a mouth infection. If left untreated, the infection usually spreads to the eyes and ears, resulting in an oozing swollen eye or tympanum, as the infection works its way throughout the head area. Treatment consists of cleaning the infected area together with the use of an injectable antibiotic until the symptoms have subsided. My most severe case of this involved a female who just would not open her mouth no matter how hard I tried to make her. Eventually I had the idea to stick the eraser end of a pencil in between her jaws so she could not keep closing her mouth. Upon doing this, she clamped down so hard on the eraser that she cracked her bottom front jawbone in half! These lizards have very powerful jaws and this proves it. That is why injections are my preferred choice over any oral medication. Not only did I have to treat the mouth infection, now I had to treat a broken jaw as well. I also determined that she was gravid at this time. To help speed the healing process, I decided to house her in a screened aquarium and stick it halfway out the window like an air-conditioning unit, to expose her to natural sunlight. The part of the aquarium inside the house provided the hide area and the shade, so she could venture out into the sun when she felt the need to. When all the medication was done, her jaw mended, although a bit crooked, and she eventually gave birth. I still have her in my collection to this day. This is just an example of how tough and hardy these little lizards can be.

The second medical problem I have encountered is a femoral pore infection. This causes the rear legs to swell up and accumulate pus behind the femoral pores. The lizard will continue to be alert and eat regularly as if nothing is wrong, but if no medication is administered, the back legs will continue to swell until the lizard has trouble walking. To treat this type of infection, injections must be given and the pores cleaned out by gently squeezing out the pus and bacteria until the infection subsides and heals. I'm not sure what causes this, but it may have something to do with not enough rough substrate to continually rub up against, thereby keeping the femoral pores cleaned out naturally. These pores do secrete a waxy substance in both males and females that could build up and clog the pores. Since encountering this type of infection, I've included rougher climbing rocks to help scrape off these pores on a periodic basis. I have not had any recurrences since this was done.

The last medical problem is a common one of the occurrence of parasites. This again involves a lizard that is not eating, but shows no interest in food, whatsoever. If this happens, first I'd check the mouth to make sure it is not a mouth infection. If that looks all clear, then a stool sample is taken to determine what parasite is present and what treatment is in order. After a week or two the lizard is usually back to

normal and eating regularly. Sometimes in the colder months armadillo lizards will go off feed for a few weeks, as they would be hibernating in the wild at this time. If this happens, just keep an eye on the animal to make sure it's not losing any weight and that it is still healthy. Eventually it should begin eating again when it feels ready. Make sure to check on a lizard if it is hiding all the time and never comes out. It could have an infection or be stressed out. This has occasionally happened to me. By the time I had noticed there was a problem, it was too late to save the lizard in question. The key to good husbandry is to always observe these lizards. You become aware of their habits and movements so if something doesn't seem quite normal it can be taken care of immediately.

Armadillo lizards are not as common in the U.S. as many other types of exotic lizards. This is due to the fact that they are not offered commercially through the pet trade with any regularity, nor have they been since 1989. Another reason is that these lizards are not a moneymaking commodity for a lot of reptile breeders. They are slow to reproduce and only net one offspring each year, per female, if you're lucky. Compare that to your more acceptable, double clutching lizards, who lay dozens of eggs each year, and you can see why most breeders will not bother with a lizard that is not going to contribute substantially to profits. People do keep them in this country, but not in any great numbers. Few American zoos, even, have bred them in captivity. You normally will not see them at any of the reptile shows held around the country, because nobody is really captive breeding them, at least for general sale to the public. Your best bet in obtaining this type of lizard, is the same way I purchased mine years ago—by placing various ads and hoping someone responds. You can also network through the Internet to see if there are any available. Once you do find one, there is no guarantee as to how old it is going to be or what sex. Remember, I still have my first two male armadillo lizards from 1985, and they were adults then, so who knows how old they really are at this point? Also, they are still viable in the reproductive department, mating and breeding to this day. In this day and age of instant gratification you may have to be patient in obtaining these lizards. I had to wait two years before I found a few more to add to my original two.

Let's now review the basics in keeping these lizards in a captive environment.

Cage enclosure:

A large aquarium will do for two or three of these lizards, although I like to give them as much room as possible so that they can behave in a more natural manner. It's always more fun to see them run around—something that they can't do in a small aquarium. I've found in a few of my large enclosures, males will usually stay to one end of the cage, with females grouping on the other. It is very important to include several hiding areas throughout the cage and let the animals choose which one is best for them. Flat rocks, propped up an inch off the ground work best. Armadillo lizards like to be able to wedge in between rocks naturally, so they like to be able to feel that roof of rock on their backs. If you were lift up one of these rocks, you would notice that the lizards arch up their backs in order to feel where the top of their hiding place is.

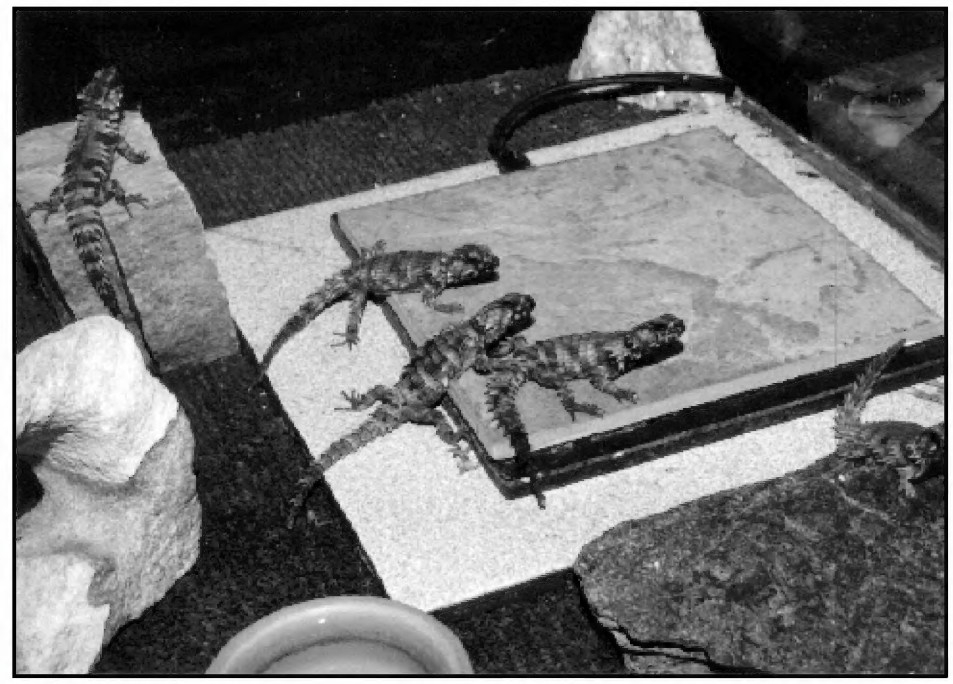

Figure 9. A group of juvenile armadillo lizards warming themselves on a heating pad inside the enclosure. Photograph by the author.

Avoid a hide area with too high a ceiling, as the lizard may get stressed if not able to hide properly.

The drinking area should be shallow—one inch or so high—so they can find water without a problem. Large rocks should be included for climbing and basking purposes. You can use a rock or sand substrate, but they will probably eat it, which may lead to medical problems. Astroturf works for me, although a few have tried to eat that too. I recommend full-spectrum lighting in combination with blacklight lighting, kept as close to the lizard as possible (12–15 inches is best). You can start out with this lighting and judge for yourself how beneficial, or not, it is. Some sort of heated area (heating pad, hot rock) (Figure 9) is needed in the autumn and winter months, especially in the colder states in the U.S. Use common sense with these items. If the area gets too hot, it may be necessary to diffuse the heat with ceramic tiles on top and underneath. I use a twelve-inch heating pad on top of which I put a twelve-inch ceramic tile. I have never yet had an armadillo lizard burn its underbelly lying on one of these.

Temperature:

A room temperature of 70–85°F is fine, perhaps a bit cooler in the winter, as they can certainly tolerate it. I have always worried about my lizards getting too hot, rather than too cold. The room that they are now in can get up to 100°F in the summer. I keep a small air conditioner in one of the windows to keep the temperature down when this happens. A fan of some sort to circulate the air is also desirable. Although they can tolerate high temperatures, too much might stress them out. In the winter they are still active with the cooler room temperatures, (65 to 70°F) as they utilize the heating pads during the day at this time of year.

Food:

The basic staple diet consists of crickets, superworms, butterworms and waxworms; the latter two have a higher fat content so I use them sparingly. I actually have two groups who would rather eat superworms than crickets. They will only eat crickets if they get good and hungry enough. I feed my lizards once a week, making sure that everyone gets fed. When they are in groupings of four to six, you have to see to it

that certain lizards aren't hogging the food items. Always put in only enough food items that all will be eaten, and watch to make sure this is happening. This is especially true for superworms, for if they crawl away somewhere; they will morph into a large black beetle that the lizards do not like to eat. You will probably find one somewhere outside the cage enclosure, perhaps running across your carpeting at the most inopportune time. Always use a vitamin-mineral powder on your food items. The smell of this helps the lizards to better locate the crickets and it gives the lizards the essential vitamins they may otherwise be missing in an indoor, captive environment. Also, feed the insects you intend to use as food items twenty-four hours before you give them to the lizards. Kale, collard, turnip, and mustard greens work well because they have a high calcium content. By feeding your insects, you'll find that they will live longer and you won't have to keep getting them so frequently.

Armadillo lizards are one of the most easily kept lizard species. Their longevity in captivity and relatively few special requirements make them an excellent choice as a captive lizard pet. Unfortunately, they are scarce in the pet trade and command a high price as a result.

I hope this information is beneficial to anyone who currently keeps armadillo lizards or who may just want to learn more about them. They are an overlooked, little known species who, I think, are one of nature's most interesting lizards. May they never go extinct!

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A Note on Sexual Dichromatism in *Clemmys guttata* from Erie County, Pennsylvania

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Sexual dimorphism in body size and coloration (dichromatism) is common in turtles (Zug et al., 2001). Sexual dichromatism has been reported from the following genera of North American turtles: *Caretta*, *Dermochelys*, *Apalone*, *Kinosternon*, *Clemmys*, *Emydoidea*, *Terrapene*, and *Trachemys* (Ernst et al., 1994). Sexual dichromatism in the spotted turtle (*Clemmys guttata*) is exhibited by marked differences in both chin and eye coloration. Males have a tan chin and brown eyes; females a yellow chin and orange eyes (Ernst et al., 1994). Ernst (2002 pers. com.) reported that *C. guttata* from Pennsylvania (Lancaster County), Maryland and northern Virginia are sexually dichromatic at hatching and that these differences in coloration do not change over time.

In this note we report changes in chin coloration from two *C. guttata* that were marked and subsequently recaptured at our study site in western Erie County, Pennsylvania.

At time of capture the following data were collected: straight line carapace and plastron measurements, sex, shell anomalies and injuries, mass, estimated age, behavior, habitat, environmental conditions, cloacal and environmental temperatures. After data collection, the turtles were marked with a numbered tag (National Band and Tag Co., Newport, Kentucky), photographed, and released at the point of capture. Upon each capture / recapture, photographs were taken of the carapace and plastron to document changes in pattern and new injuries. Turtles were considered mature if their plastral length was greater than 80 mm (Ernst, 1970). Turtles were sexed using the dichromatic characters (Ernst et al., 1994), and the presence of the following characters: males, concave plastron, vent located beyond the rim of the carapace; females, a flat to slightly convex plastron, cloacal opening located anterior to the margin of the carapace (Ernst and Barbour, 1972).

Turtle #0012 was hand captured on 26 April 1999. It had a carapace length (CL) of 80.7 mm and a plastron length (PL) of 71.6 mm. The turtle's chin coloration was reddish yellow, characteristic of a female. The shape of the tail, condition of the plastron (flat) and location of the cloacal opening (cloacal opening not beyond margin of carapace) were also indicative of a female. Although this turtle was less than 80 mm in plastral length, we identified it as a female based upon its chin coloration and other characteristics (i.e.., flat plastron etc.). When recaptured on 15 April 2002, it had a 92.5 mm CL and 81.1 mm PL. Comparing notes and photographs from the previous capture in 1999, it was noted that the turtle's chin color was much darker, the plastron was now slightly concave, and the cloacal opening was beyond the rim of the carapace. The turtle, previously considered a female, was a male.

Turtle #0018 was captured on 17 May 1999, with CL of 96.3 mm and PL of 81.6 mm. The chin was orange. The plastron was flat, and the tail female-like, with the vent approaching the rim of the carapace (Figure 1). This turtle was also identified as a female.

This turtle was recaptured on 22 May 2000, while basking. Its CL was 102.4 mm and its PL was 82.6 mm. No changes in morphology or coloration were noted during this first recapture. On 15 April 2002, turtle 0018 was recaptured again with a CL of 110.1 mm and a PL of 86.7 mm. The chin was now dark, the plastron slightly concave, the tail was characteristic of a male with the cloacal opening beyond the margin of the carapace (Figure 2). This turtle was a male.

This is the first report of female chin coloration occurring in subadult male *C. guttata*. It is also the first time that changes in the coloration of the chin have been documented for this species. Our observations are significant because it has been implied that chin and eye coloration can be used to sex hatchling spotted turtles (Ernst et al., 1994). At this time the cause(s) of these changes (in coloration) are unknown. We have ruled out organic staining as a possibility, as coloration on

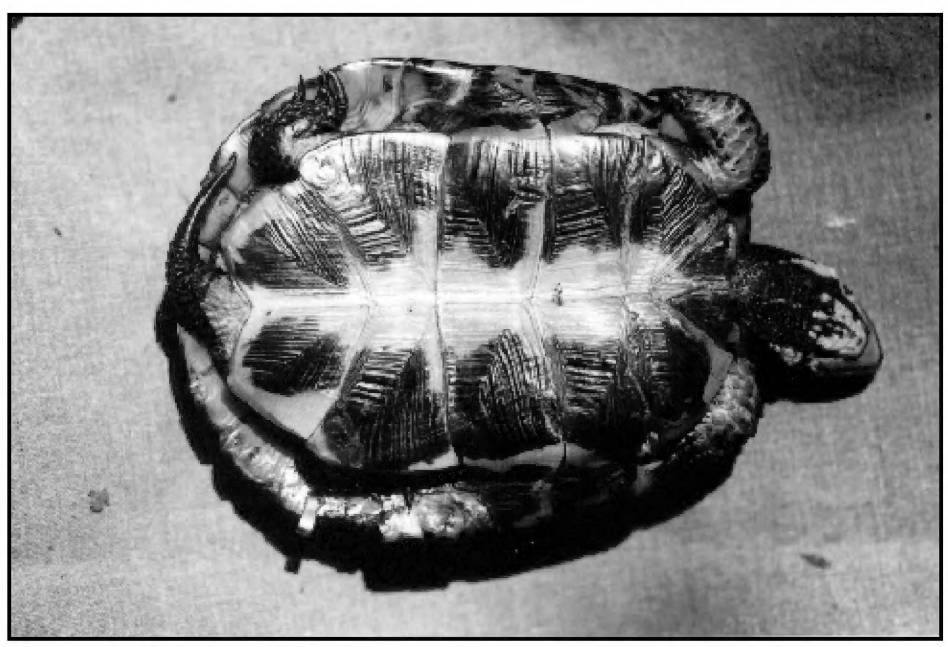

Figure 1. Turtle #0018, ventral view, on 17 May 1999. Note the light coloration of chin and gular region.

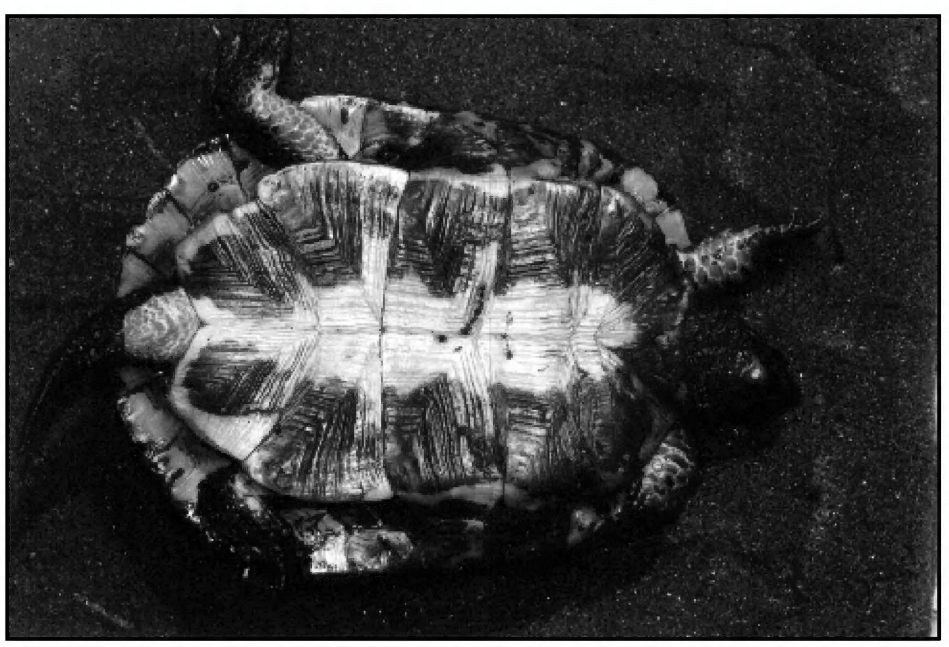

Figure 2. Turtle #0018, ventral view, on 15 April 2002. Note the dark chin and gular region.

the tail, limbs, and plastron was not affected. Pollution also seems unlikely, but is worthy of further consideration. Contaminants that cause endocrine disruption, such as polychlorinated biphenyls (PCBs), may elicit sex reversal in reptiles with temperature dependent sex determination (Guillette, 2001). Another possibility is that in some populations, male spotted turtles normally undergo ontogenetic changes in chin coloration. In our turtles, changes in chin coloration seemingly coincided with changes in the plastron, tail, and location of the cloacal opening relative to the carapacial margin indicative of sexual maturity. It is interesting that changes in chin coloration have not been observed in other, more southern populations. More work needs to be done to determine the cause(s) of changes in coloration, and to determine the distribution and prevalence of such changes in other populations. We suggest that workers use caution when using sexually dichromatic characters to sex juvenile *C. guttata*.

Litzgus and Brooks (1999) have demonstrated that spotted turtles in a northern population in Ontario, Canada, reached sexual maturity at a larger size relative to more southern conspecifics. One of our turtles (#0018) did not acquire the dimorphic characters typical of a mature male spotted turtle (e.g., concavity of the plastron, cloacal opening beyond carapacial rim, etc.), until after a carapace length of 102.4 mm and a plastron length of 82.6 mm were reached.

Acknowledgments

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Book Review: *Amphibians and Reptiles of Indiana, Revised 2nd Edition* by Sherman A. Minton, Jr. 2001. Indianapolis: Indiana Academy of Science. xiv + 404 pp. Cloth. $38.00 ($30.00 for Indiana Academy of Science members) + postage ($3.50 U.S., $10.00 foreign)

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Sherman A. Minton, Jr., M.D., the son of an Associate Justice of the U. S. Supreme Court, was a Professor of Medical Microbiology at the Indiana University School of Medicine for most of his career. Minton had a distinguished research record in the biological properties of snake venom, antivenins, and field herpetology. Sherm grew up in New Albany, Indiana, across the river from Louisville, Kentucky, where, in 1936 he began a study of Indiana amphibians and reptiles that continued until his death in 1999. In 1972, his *Amphibians and Reptiles of Indiana* was first published as Monograph No. 3 by the Indiana Academy of Science. The second volume was scheduled for release at an April 1996 herpetological symposium in Indianapolis honoring Dr. Minton. Unfortunately, various problems caused delays that held up the production of the book until 2001, two years after the death of the author.

Both of Minton's books essentially follow the careful methodology of P. W. Smith's 1961 volume, *The Amphibians and Reptiles of Illinois* (Illinois Natural History Survey Bulletin 28, Article 1, 298 pp.), that set the standard for "state herpetologies" for years to come. One of the major features of this approach is state maps divided into counties for each species, with dots and other small symbols pinpointing each occurrence. Most of these pinpoints are based on museum specimens examined by the authors. Pinpointing localities in books is much less common today, as such places may be herpetological "hotspots" that might be exploited by some collectors.

Although the book was obviously published several years after the original manuscript was submitted, the work stands as an eminently valuable contribution to the herpetology of Indiana. No other person that I am aware of has (or had) the knowledge of Hoosier herpetology that Sherm possessed. In fact, his accurate field observations of the habitats, behavior, and ecology of the amphibians and reptiles of Indiana are one of the most important features of the book. Obviously, as Sherm pointed out in the volume, the herpetofauna of the state today is vastly different that it was when he began his studies.

The introductory chapter of the book contains an account of the method of study used and areas visited by the author. Symbols used in the "dot maps" for each species are explained. A scholarly section on the history and status of herpetology in Indiana is enhanced by a discussion (with table) on Indiana type localities and their authors, including such eminent naturalists as Agassiz, Cope, Gray, Hallowell, Hay, LeSueur, Wied-Neuwied and Yarrow. The fact that the red-eared slider (*Trachemys scripta elegans*) was originally described from the Fox River at the utopian community of New Harmony, Indiana, by Wied-Neuwied is noteworthy. An excellent account of the topography and climate of Indiana is given, with color maps of the Natural Regions of Indiana and the drainage systems of that state. A section on the general distribution of Indiana amphibians and reptiles follows, with excellent color pictures of typical habitats provided. A discussion of endangered and special concern species follows. Finally, a checklist of Hoosier amphibians and reptiles leads nicely into the species accounts.

The Species Accounts form the heart of the book (pp. 27-367). Subtopics are as follow. Amphibians [Key to Adults, Key to Larvae, Salamandersm (accounts), Toads and Frogs (accounts)]; Reptiles [Key to Reptiles, Turtles (accounts), Lizards (accounts), Snakes (accounts)]; Species Excluded or Doubtfully Recorded from Indiana; Species Possibly Occurring in Indiana; Exotic, Introduced, and Extralimital Species.

Each species account is sytematically divided into the following units: Identification; Description; Range; Habitat and Habits. Each unit is carefully and thoroughly done, with the Habitat and Habits unit being especially interesting to midwestern herpetologists.

Two maps are included for most species: a "dot map" for the state itself and a map of the eastern United States showing the general range of the taxon involved. Since the general range maps were adapted from Conant and Collins (1991), the ranges in the dot maps, in a few cases, do not exactly fit with those in the state maps. In some maps, the distribution of the Indiana subspecies or species complexes are shown.

Except for a very few cases, the color illustrations are excellent to good and all of the illustrations will help the readers identify the amphibians and reptiles of the state. A small problem to this reviewer was the fact that several illustrated species were not identified. These include a juvenile racer (*Coluber constrictor*) [inside title page]; cave salamander (*Eurycea lucifuga*) [p. 27]; eastern box turtle (*Terrapene carolina carolina*) [p. 157]; five-lined skink (*Eumeces fasciatus*) [p. 219]; western mud snake (*Farancia abacura reinwardti*) [p. 245]; and eastern hognose snake (*Heterodon platirhinos*) [last printed page of book].

The section on excluded or doubtfully recorded species is not illustrated, but the section on species possibly occurring in Indiana is provided with nice color images. The section on exotic, introduced, or extralimital species is interesting but brief. The terms in the Glossary are well chosen; the literature cited section is fairly comprehensive; and the index is easy to use, with the terms well chosen. In summary, this is an excellent book that every professional or amateur herpetologist should own.

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HerPET-POURRI

by Ellin Beltz

Don't Mess With Texas Toads

GreenLines [June 4, 2003, Issue 1878] reports: The Houston toad (*Bufo houstonensis*) has found an unlikely friend in a gun-toting, redneck, Texas Republican preacher, and local GOP chairman who has volunteered to make his 550-acre ranch a 'safe harbor' for the palm-sized amphibian in exchange for more control over his property in the future—provided that the toad population there doesn't decline from current levels says the *Houston Chronicle* May 31, 2003. The preacher will plant native grasses, reduce the size of his cattle herd and fence off ponds where the endangered toad breeds. With 94 percent of the state in private ownership, safe harbor agreements and other voluntary conservation programs are crucial to the survival of imperiled species such as the Houston toad. Before the preacher met the toad "I couldn't spell 'environmentalist,'" he said. "Now I am one."

Adhesive Design Based on Gecko's Toes

"Inspired by geckos' toes, a new super-sticky tape is so strong that it can stick a person to the ceiling by just one hand. With a few tweaks, the prototype adhesive could have limitless applications—tires with more grip, surgical tape and sticky gloves for rock climbers. Geckos are famed for their wall-climbing antics and their ability to hang from the ceiling by a single toe. They can do this because their digits are covered in millions of tiny hairs that bond with any surface. . . . The tape is covered in millions of protruding plastic polymer hairs. Each one is just two thousandths of a millimeter high, allowing them to get extremely close to the molecules that make up a surface. On dry surfaces the hairs are subject to weak attractions called van der Waal's forces that occur between molecules. On wet ones, suction-like capillary action grips the hairs. . . . Because there's no glue, the surface is left clean when the tape is removed. Like its inspiration, the new tape is waterproof and re-useable. . . . A one-meter-squared piece of gecko tape would cost tens of thousands of pounds to produce, so the team needs to find methods for cost-effective mass production. The prototype tape only stayed sticky for seven or eight attachments. Geckos, on the other hand, re-use their gummy feet throughout life. . . . Gecko hairs have split ends, or 'hairs on hairs.' The challenge is to manufacture these delicate structures synthetically. Different materials could also be used to improve hair strength. Kevlar, the material used to make bulletproof vests, might provide an alternative. . . ." [*HerpDigest*, based on *Nature* Magazine, June 2, 2003]

SARS/Animal Link?

"The global SARS virus may yet be good news for the world's endangered animals, victims of an illegal Chinese habit of eating rare species, but also prime suspects as incubators of deadly, new human pandemics. China is regularly criticized by world animal protection groups, which they say turn a blind eye to trade in endangered species, because it is a lucrative business. But now, faced with a SARS epidemic at home that has dented its global image, created panic in its capital, and threatened its economy and security, China has been pushed into action. A Chinese public security official in Shenzlien, in the southern province of Guangdong, said on Wednesday China had raided tens of thousands of markets, restaurants and kitchens to crack down on the trade and consumption of protected animal species. 'In Guangdong, we have a law which says consumers must also be punished,' said the official, who declined to be named. 'This law has been around for a while, although we have never punished anyone for consuming. But we will punish them from now on, if we find them guilty.' The operation, code named 'Spring Thunder,' is part of China's belated battle to stop the spread of the global SARS virus, which some medical experts believe may have originated from the wild game that Chinese are so fond of consuming. China's official Xinhua news agency reported that 170,000 forestry police took part, raiding 14,900 animal fairs and 67,800 hotels and restaurants across the country. Officials confiscated 838,500 endangered animals and arrested 1,428 suspects. Neighboring Hong Kong is also criticized as a conduit for the trade in endangered animals into China. China's failure to adequately inform the World Health Organization when SARS broke out in Guangdong in November last year has made mainland China and Hong Kong global epicenters of the deadly and infectious new disease, with almost five thousand cases, and nearly 300 dead.

"Several Chinese doctors have blamed the appearance of SARS on the [wild game] business. They say some of the first SARS cases were in people who slaughtered and cooked game birds for restaurants. This link is not proven, but southern China's towns and farms, where humans live cheek by jowl with their own stock, and pack markets with endangered species in cruel and unhygienic conditions, have historically been the place where some of the world's most deadly plagues have begun. When a virus manages to leap the barrier between species, chances are it will be virulent and have no known cure. The public security official said hundreds of markets, kitchens and restaurants were raided between April 10 and 20 in Shenzhen, just across the border from Hong Kong. Protected snakes, pangolins, anteaters, cranes and turtles were confiscated. 'The operation is aimed at stopping the trade and consumption of protected species. In Shenzhen, we raided at least a few hundred restaurants, kitchens and markets and arrested traders there,' he said. Traders of protected species face jail terms of up to 15 years in China. Those found smuggling China's top protected species, the panda, face death, the Shenzhen official said. Scientists in Hong Kong have identified the SARS virus, which is from the same family of viruses that causes the common cold, as an animal strain that is new, or which they have never seen before. Scientist Dennis Lo, who was among a group of experts at the Chinese University that cracked the genomic sequence of the SARS virus, said it may have come from wild animals. 'The virus is close to viruses found in rats and bovines. It's likely that the virus may have come from an animal that's not been studied before, such as wild game,' Lo said. The consumption of wild game is not rampant in Hong Kong . . ., although residents here consume reptiles such as snakes and lizards during the winter months. Smugglers often use this former British colony, which returned to Chinese rule in 1997, as a transit point to spirit exotic and protected species such as monitor lizards, pangolins, rare snakes and turtles into the mainland, where they end up on dinner tables." [Reuters,

Science, April 30, 2003, from James Harding]

Chinese Province bans Wild Game

"Southern China is well known for eating delicacies like monkey, snakes, bats and exotic cats but authorities now have put **an** end to this. As a reaction to the discovery of the deadly SARS virus **in** civet cats, a catlike mammal, the southern Guangdong Province has banned the trading and eating of wild animals. The Government hopes the change will help restrain the spread of SARS since the findings seem to confirm suspicions that the virus jumped from animals to liumans. However, it is unknown whether the crackdown will change Guangdong's tradition of eating wild animals, which many believe benefits the hui-nan body." [Australian Broadcasting Corporation, *HerpDigest*, extra May 27, 2003]

Turtles dying in record numbers

"Sea Turtle Deaths More Than Double: Sea turtle deaths along much of the southeast Florida coast are showing a significant rise this year, with the number of strandings along the coast from Broward to St. John's Counties two-and-a-half times the number of casualties for the same time frame in 2002 says the Palm Beach *Sun Sentinel*, May 16. The increase has researchers scrambling and has filled turtle-rehabilitation centers and may only be the tip of the iceberg; scientists believe only 10 percent of dead or sick turtles are discovered. According to the Florida Marine Research Institute, 2001 was the worst on record, with 1,338 around Florida and last year came close to that mark." [*GreenLines*, May 19, 2003, Issue 1867]

More viruses to be released in wild

"Scientists are ready to wage germ warfare on cane toads. The CSIRO [Australian Agency] is developing a virus that would stop tadpoles maturing. The [Northern] Territory's Daly River region is a key research base for the project. CSIRO senior scientist Tony Robinson said two years of preliminary research had shown the virus could be developed. He said a key part of the research, carried out in conjunction with the Australian Animal Health Laboratory in Victoria, was to ensure the virus would not affect native frogs. The Federal Government agency Environment Australia has funded the initial two-year research phase to the tune of about $1 million. 'What we've proposed to Environment Australia is we would look at a means of preventing the metamorphosis in cane toads,' Dr. Robinson said. 'We would do that by using a virus which affects only cane toads that would introduce a gene into the toad that would prevent the tadpole developing. We would use a virus as a taxi to deliver the gene that would interfere with the (maturity). It's an ambitious project. There is still a lot of work to be done.' Dr. Robinson said the Federal Government had just renewed funding to the project, meaning researchers had convinced Treasury bean counters the plan could work. In 1996, the Federal Government slashed CSIRO research funding into a Venezuelan cane toad virus they hoped could be used to reduce numbers in Australia. Dr. Robinson said it could be 10 years before the virus was spread throughout cane toad populations. The toads arrived in the New Territory's east about four years ago and could arrive in Darwin in the next two years. They have reached Pine Creek, about 220 kilometers south of Darwin. Dr. Robinson said a team of researchers from the University of Canberra was examining the Daly River's ecology. 'What we're looking at is the impact on species like crocodiles and goannas on rivers where there are now no toads,' Dr. Robinson said. [*Northern Ter-ritory News*, Darwin, Australia, May 1, 2003, from *Herp-Digest* 3(35), May 4, 2003]

New germs causing problems worldwide

"Recent studies indicate that 'wildlife, birds, fish, coral and plants are all being hit hard by new germs, sometimes driven to the verge of extinction,' affected by the same environmental degradation that is causing a sharp increase in infectious diseases among humans says the *Duluth News Tribune*, Knight Ridder, May 4, 2003. According to a 2000 report in the journal *Science* by University of Georgia ecologist Peter Dezak, 'new infectious diseases constitute a substantial threat to the conservation of global biodiversity.' Recent wildlife epidemics include a [chytrid] fungal disease that has decimated amphibians, the Ebola virus and African primates, an unknown infection that has killed up to 95 percent of vultures in India, the West Nile virus in the Midwest and new diseases that have shoved the endangered Florida scrub jay closer to extinction." *[GreenLines*, May 8, 2003, Issue 1860] Not to mention SARS and the new and unnamed Venezuelan cane toad virus which Australia plans to release in the wild as it did quite unsuccessfully with rabbit virus before.

The concrete rolls on

"A state court has given a notorious Southern California developer, Newhall Land & Farming Co., the go ahead to expand the Santa Clarita auto mall, ruling against a legal challenge by the Center for Biological Diversity that four more car dealerships would harm remaining habitat for the endangered arroyo toad says the *Los Angeles Times*, May 6, 2003. According to the Center the developer linked the car-lot expansion to improvements of nearby ball fields 'in an attempt to manipulate public opinion.'" [*GreenLines*, May 16, 2003, Issue 1866]

A tale of two species

(1) "Ruling in favor of developers, a federal judge has thrown out a 400,000 acre critical habitat designation for the Alameda whipsnake on grounds that the USFWS 'did not adequately perform an economic analysis of the area or provide enough evidence to support the designation for species survival' says the *Whittier Daily News*, Associated Press, May 15, 2003. . . . The ruling [is] 'a terrible setback' for the whipsnake, which has already lost much of its prime habitat to urban sprawl, 'The court's decision is really a victory for luxury homes and country club golf courses.' The whipsnake will still be listed as a threatened species and ESA protections against taking, including taking of habitat, will remain in place while the USFWS prepares a new critical habitat designation." [*GreenLines*, May 19, 2003, Issue 1867]

(2) "The USFWS has proposed a threatened listing for the central California population of the tiger salamander, along with designating 1.1 million acres as critical habitat says the *San Francisco Chronicle* May 17, 2003. With most of the proposed critical habitat on private lands, and about half of that used for ranching, the service contends that the California tiger salamander 'coexists so well with cattle that ranchers should be exempted' from ESA prohibitions against 'moving

or accidentally killing the salamanders during routine ranching activities such as cattle grazing and maintenance of stock ponds.' The salamanders breed in stock ponds and use squirrel and gopher holes for shelter. [*GreenLines,* May 22, 2003, Issue 1870]

Hopping not to kill native frogs

"Wildlife officials are visiting the Calaveras County Fair and Frog Jumping Jubilee this weekend to make sure that the celebrated reapers do not spread disease and are not released into ponds where they can push out native frogs. 'I bet you Mark Twain is laughing his tail off,' said . . . [the] manager of the fair, which ends on Sunday. 'He created all this just from a little short story, his first published work. Now look at all this controversy and environmental concerns. I hope he's proud of the way we're handling this.' The inspections at the contest are meant to protect amphibians in the Sierra Nevada, which have lost habitat and been harmed by pesticides. 'Bringing a whole group of diverse populations together and then spreading them out again is a perfect model for spreading disease, as it is in humans,' said . . . [the] chief of the fisheries programs of the California Department of Fish and Game. The department wants to make sure that the competitors, aggressive normative bullfrogs, are not released into the few remaining places where native red-legged and yellow-legged frogs survive. Returning frogs to nature violates California law, but an obscure provision in the Fish and Game Code exempts frog-juinping contests. At the Calaveras County event, now in its 75th year, wildlife officers simply ask operators and contestants to cooperate. Green fliers urge people to be 'frog-friendly' and give their frogs to fair organizers after the contest. The wildlife officials were generally reassured after inspecting the 'frog condo' where about 300 frogs collected by organizers can be rented by small-time participants, and an operation by a major competitor, . . . [from] Oregon. [His] 300 frogs were captured in the nights before the contest and are housed in plastic boxes in an insulated trailer. About 150 of the most energetic compete, then all of the frogs are returned to the ponds and sloughs where they were found. The jumping contest draws about 2,000 bullfrogs and more than 40,000 visitors to Angels Camp, an old Sierra gold-mining town in Calaveras County, 90 miles east of San Francisco. It started in 1928, when town boosters organized the first jump to celebrate the paving of Main Street. It harkens to the tall tale that Twain heard in the Angels Hotel and published in 1865 as 'The Celebrated Jumping Frog of Calaveras County.'" [Associated Press, May 18, 2003, from *HerpDigest*]

The concrete rolls on II

Allen Salzberg writes: "Though the paper does not specifically cover herps, it addresses the whole problem of roads and wildlife and so is worth attention—Defenders of Wildlife and Surface Transportation Policy Project (STPP) are pleased to announce the release of our new report, Second Nature: Improving Transportation without Putting Nature Second. The full report is available online at http://www.defenders.org/habitat/highways and http://www.transact.org. The report outlines the impacts of surface transportation infrastructure on America's wildlife and provides win-win solutions that retain and respect both our mobility and conservation objectives." [May 25, 2003]

News About Herp News

As you know, I don't usually quote so directly from prime sources. But I wanted you to see the tremendous impact of a couple of online services, namely *HerpDigest* and *GreenLines*. You've seen before how much material is collated by Wes von Papineäu; you can read his online feed at http://www.kingsnake.com. Wes's hobby (perhaps I should say "obses-sion") is fully supported by his full-time real world job. *GreenLines* is part of Defenders of Wildlife, but *HerpDigest* is created on a home computer by Allan Salzberg (supported by wife Anita). They have also authored two books: *Turtles*, described by *Herpetological Review* as "the first book about turtles for children written by people who love turtles," and Anita's *Confessions of a Turtle Wife*, "the story of a man, a woman and the turtles that threaten to come between them." To read sample chapters or acquire these books and help support *HerpDigest*, visit http://www.turtlewife.org or write Allen Salzberg, 67-87 Booth Street, Forest Hills, NY 11375. Allen points out that "in the U.S. all donations are tax deductible."

"Pretty Darn Fine" Bibliography

For those interested in the herpetofauna of New Mexico, or the Southwestern U.S. in general, the following revised document is available on the Web, courtesy of the University of New Mexico's Museum of Southwestern Biology (MSB), Division of Amphibians and Reptiles: "A Supplemental Bibliography of Herpetology in New Mexico." (Version: 12 May 2003). Go to: http://www.unm.edu/-msbherp/ and click on "Publications." The document is in PDF format, readable and printable with Adobe Acrobat Reader. An earlier version of the bibliography was posted on the MSB website last December. The latest version has about 100 additional references and has been extensively edited to make it more useful. The bibliography is intended to provide a list of references not found in the comprehensive book *Amphibians and Reptiles of New Mexico* by W. G. Degenhardt, C. W. Painter, and A. H. Price (1996, Univ. New Mexico Press, Albuquerque). Annotations for most references and a taxonomic index are also included. To those who work or have worked on herps in the American Southwest, I am continuously looking for new citations pertaining to New Mexico or adjacent areas to add to the bibliography. Please send any references not cited in the bibliography or in Degenhardt et al. (1996) to my E-mail address. Alternatively, you may send reprints of articles to my regular mail address (below). I'm interested in complete citations for journal and magazine articles, books and book chapters, contract reports, theses, dissertations, symposium proceedings, etc. All contributors will be acknowledged in future revisions. Feel free to forward this message to others who may be interested. Thank you. James N. Stuart, Endangered Species Recovery Plan Biologist, Conservation Services Division, New Mexico Dept. of Game & Fish, PO Box 25112, Santa Fe, NM 87504-5112. E-mail: JStuart@gmfsh.state.nm.us.

Thanks to all the online contributors, Wes von Papineäu, Allen Salzberg, Jim Stuart, Desiree Wong, Raymond Hoser, Karen Furnweger and others. And thanks to everyone who mails clippings about herps and oddball tidbits of life to: Ellin Beltz, POB 934, Ferndale, CA 95536-0934. Are you a frog photographer? If so, please E-mail me as soon as possible ebeltz@ebeltz.net.

Unofficial Minutes of the CHS Board Meeting, May 16, 2003

Lori King called the meeting to order at 7:40 P.M. Board members Lori King, Mike Dloogatch, Jim Hoffman, Joan Moore and Jenny Vollman were in attendance. This did not constitute a quorum.

Officers' Reports

Recording Secretary: Zoe Magierek was absent. Gary Fogel read the minutes of the April 18 board meeting, which had been taken by Mike Redmer.

Treasurer: Jim Hoffman presented the balance sheet and income statement for the month of April, as well as an encouraging look at the finances of this year's ReptileFest—not yet complete because some expenses have not yet been submitted.

Vice-president: Linda Malawy was not present. Lori said that speakers have been scheduled for July (Robert Powell) and October (Geoffrey Sorrell).

Membership Secretary: Mike Dloogatch distributed a graph of the monthly *Bulletin* mailings from January 2000 through April 2003. The April 2003 mailing went to 736 members.

Standing Committees

ReptileFest: Lori summarized the ReptileFest Committee wrap-up meeting, which was held on Wednesday, May 7. The most likely weekend for next year's 'Fest is April 3–4.

Shows: Jenny Vollman said that the Bellwood School District would like us to participate in their Career Day. Jenny also announced that she is looking for volunteers to help with our tables at the Field Museum's Members' Nights, June 4–6, particularly for Wednesday and Thursday nights. Joan Moore told the board that the CHS is scheduled for three more "Nature Day" weekend shows at the Notebaert Museum: May 31–June 1, July 12–13, and August 23–24. Joan spoke about the difficulties she's been having in getting CHS members to help with these shows. Bob Herman suggested that Joan make an announcement at the next meeting and pass around a clipboard sign-up sheet.

Raffle: Bob Herman will be trying to speed up the monthly raffle by combining items as the raffle progresses.

Book sales: Joan Moore reported that, after two months, book sales at the meetings are going nicely. We have just about made up the initial expenditures and still have a nice inventory of books on hand for sales at future meetings.

Ad Hoc Committees

Zoo trip: Bob Herman has scheduled a CHS bus trip to the Indianapolis Zoo for Saturday, September 13. He is hopeful that the cost can be set as low as $30 per person. Bob wanted an okay from the board to give the bus company a deposit, but in the absence of a quorum it was decided to wait until the general meeting to authorize this. Joan Moore asked if anyone had looked into the possibility of a trip by air to a zoo or aquarium somewhat farther from Chicago. The Tennessee Aquarium in Chattanooga, the National Aquarium in Baltimore, and the Audubon Zoo in New Orleans were all discussed as possibilities.

Suggestions

Bob Herman voiced the opinion that the CHS should hold as many members' activities as possible. He suggested a picnic.

Round Table

Lori King showed the board an ad from a local paper in which a suburban pet store was offering baby green iguanas free with the purchase of a set-up kit. Lori said that she had spoken with the owner and that the ad would be discontinued.

The meeting was adjourned at 9:10 P.M.

Respectfully submitted by Michael Dloogatch for Recording Secretary Zoe Magierek

At the May 28 general meeting, Lori King called a special meeting of the board to vote on placing a $100 deposit with the bus company for the Indianapolis Zoo trip. Besides Lori, the board members participating in the vote were Darin Croft, Mike Dloogatch, Jim Hoffman, Linda Malawy, Jack Schoenfelder and Jenny Vollman. The vote was all in favor except for Jim Hoffman who abstained because he didn't think a vote was necessary since the trip had already been budgeted.

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For sale: from Bayou Rodents, excellent quality feeder mice and rats. Every size available. Pinks starting at $20/100. Orders are shipped by overnight service Monday thru Thursday. We accept Visa, MasterCard and Discover. For more info, contact Rhonda or Peggy, (800) 722-6102.

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For sale: herp books. herp books. *Song of the Snake* by Eric Worrell, 1958, 210 pp., b&w photos, small portion of DJ missing, author's exploits in Australia, hardbound, $37; *The Cold-blooded Australians* by Gunther Schmida, 1985, 208 pp., profusely illustrated with excellent color photos of ectotherms and their habitats, large format, DJ, signed by author, hardbound, $65; *Skinks of the Northern Territory* by Paul Horner, 1991, 174 pp., 125 figs. (including many color photos), distribution maps, softbound, $24; *A Biological Survey of the Tanami Desert in the Northern Territory* by D. F. Gibson, 1986, 258 pp., 18 color plates, 35 maps, 26 pp. on herps, large format, softbound, $45; *The Fauna of British India, Ceylon, and Burma—Reptilia and Amphibia, Volume 3—Serpentes* by Malcolm Smith, 1961 reprint (1943), 583 pp., 166 figs. (drawings), map enclosed, hardbound, $75; *Snakes and Snake Hunting* by Carl Kauffeld, 1957, 266 pp., b&w photos, DJ, hardbound, $37. All books in excellent condition except as noted. Postage included for orders $25 and over; $2.50 for postage for orders under $25. Send E-mail address for complete booklist. William R. Turner, 6014 Blue Ridge Drive - Apt. A, Highlands Ranch, CO 80130; (720) 344-6197; E-mail: naturetours@mailstation.com

For sale: All of the following c.b. '03 garter snakes are now available. All are healthy, voluntarily feeding on feeder fish and mite free. **Easterns:** erythristic × melanistic × melanistic × erythristic, erythristic $100, melanistic $35; Super flames (erythristic/Blais flames × Erythristic/Blais flames) ?; Blais speckled flames $125, Blais flames $100, melanistic $35 and Florida $25 each / 2 for $40. Plains: Red/anerythristic× red/anerythristic ?, Red/hypo × albino × red/hypo × albino ?; snows (Iowa and Nebraska strains), $275; albinos from red × albino × red × albino, $150; Iowa albino, $100; Nebraska albino, $100; anerythristic, $50; quad het (Iowa snow × Nebraska snow), has genes for 4 traits, $85; Nebraska albino × red albino, $40; Christmas albino, $200; super Christmas albino (Christmas albino × red albino) *special, $300, females only/trios, $600 (buy 2, get 1 free); possible hets, $35; normals, $25 each/2 for $40. **Red Sideds:** albinos (limited number available), $350, possible het albinos (66%), $50, anerythristic, $100, het anerythristic, $50, possible het anerythristic (66%), $35, normals, $25 each/2 for $40. **Wandering:** albino, $150, hets, $75, normals, $25 ea/2 for $40. **Florida "true" blue-striped (*similis*)** $40–100. **Santa Cruz** (orange and yellow morphs), $60; **California red-sided**, $125. ? = Price is to be determined at birth. Inquire about quantity discounts. E-mail: SFelzersgarters@nc.rr.com or call Scott, (919) 365-6120 EST. Web address: http://www.thamnophis.com/features/ScottFelzer/

Herp Tours: Why pay more? Travel with the International Fauna Society, a 501 (c)3 not-for-profit organization, and experience the Costa Rican rainforest! Stay at the beautiful Esquinas Rainforest Lodge in the untouched herpetological paradise that is Piedras Blancas National Park. Meet new friends, relax in the naturally-filtered swimming pool or in the lush, fauna-filled tropical garden. May 3–10, 2003, $1195 per person excluding airfare. Discounts for IFS and Chicago Herp Society members. For details, visit The International Fauna Society website at www.faunasociety.org or E-mail: joea@faunasociety.org.

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Wanted: We need a person who can assist in the care and maintenance of an extensive tortoise collection. Our primary concern is in having a dependable care-giver while we are gone on a few weekends per year but particularly while we travel for a week at a time 2 to 3 times per year. Must have a passion for animals and have a basic understanding of the environmental and dietary requirements of reptiles; tortoises and turtles especially. Far Northwest Suburb. We will train the right person. If you are or know of anyone who is responsible and dependable and has the interest in learning, please contact: Bob or Denise Krause, (847) 844-1328 or E-mail: robertk@superpet.net.

Wanted: I'm looking for my soulmate. I want to settle down to a family before it is too late. But I have this problem. . . . When we get into hobbies and interests: old popular records, jazz and show tunes, and antique electronics are fine, but when I mention turtles, "What, are you crazy?" So maybe this is a better place to look. Please don't try to separate me from my turtles—at least not most of them. If interested, please drop a line to Ellis Jones, 1000 Dell, Northbrook IL 60062, telling a bit about yourself and giving a phone number.

Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to: Michael Dloogatch, 6048 N. Lawndale Avenue, Chicago IL 60659, (773) 588-0728 evening telephone, (312) 782-2868 fax, E-mail: <MADadder0@aol.com>.

News and Announcements

ANNOUNCING THE ANNUAL CHS ZOO TRIP

Join us on Saturday, September 13, for an adventure-filled day trip to the Indianapolis Zoo. Visit the Deserts Dome, where reptiles roam free in an artificial desert. See a special exhibit: "Drop Dead Gorgeous Snakes" (Learn more at www.indyzoo.com). Learn first-hand from zoo staff about their highly successful iguana breeding programs for Grand Cayman blue, Ricord's, Cuban ground and rhinoceros iguanas. This Zoo has also committed its financial and technical support for the endangered Jamaican iguana.

The CHS has arranged luxurious, washroom-equipped bus transportation, with movies-in-transit. We'll be leaving from the Peggy Notebaert Nature Museum at 7 A.M., returning before 10 P.M. So reserve the date. Seats are limited and will be available on a first-come-first-serve basis. We expect demand to exceed the available seats, so don't delay. Contact Bob Herman for details at (773) 667-4095 or by E-mail at bobherman@ameritech.net. Round-trip transportation with zoo admission is just $30 per person! Children are welcome.

MORE ON ARMADILLO LIZARDS

Concerning the armadillo lizard article by Gary Fogel in this issue, if you would like a more detailed photographic account of a live birth of an armadillo lizard, *Cordylus cataphractus*, as well as a live birth of a girdled-tailed lizard, *Cordylus warreni depressus*, visit our website, www.chicagoherp.org, under the members' articles section.

Next time you surf the WorldWide Web, crawl, run, slither, slide, jump, or hop over to the CHS web site!

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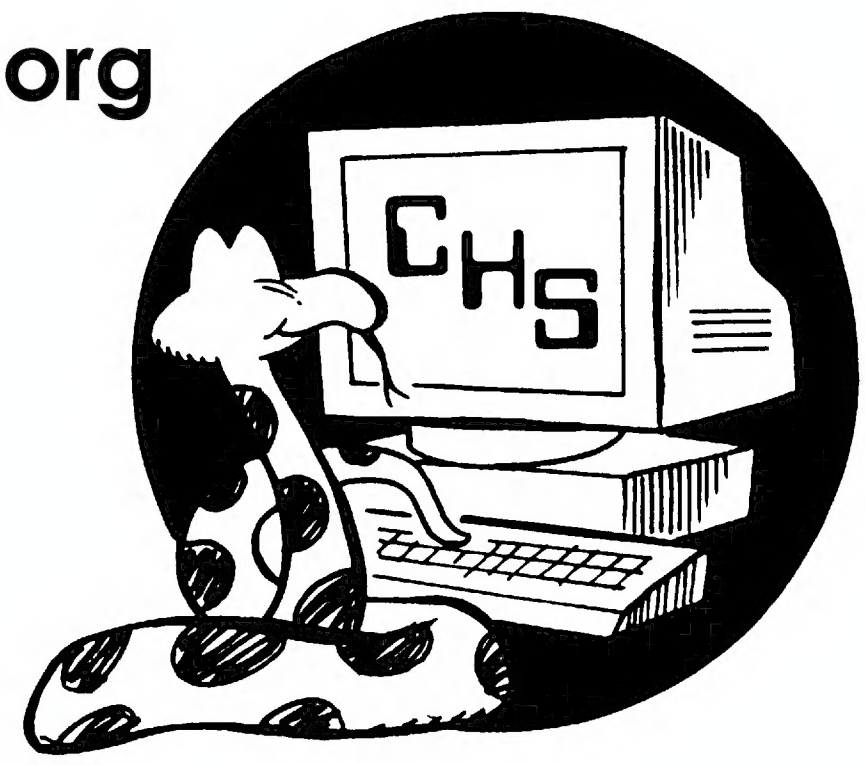

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Chicagoherp.org is accepting applications for banner advertisements or links from herpetoculturists and manufacturers of herp-related products. Visit the site and contact the webmaster for details on how you can sponsor CHS!

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, June 25, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. This will be our popular and always well-attended annual **Show & Tell** meeting. Bring an animal that you find interesting for one reason or another and be prepared to give a short (under five minutes) presentation to the group. Don't be shy. Age (yours) or commonness (the animal's) should not be a limitation. Guidelines for the occasion: don't bring venomous reptiles or endangered species, and please bring only amphibians or reptiles (this means no worms, tarantulas or other invertebrates).

Robert Powell, Professor of Biology at Avila College in Kansas City, Missouri, will be the guest speaker at the July 30 meeting. Dr. Powell will speak about his research on Caribbean lizards.

The regular monthly meetings of the Chicago Herpetological Society are held at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful new building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the June 13 board meeting, to be held at the North Park Village Administration Building, 5801 North Pulaski Road, Chicago. To get there take the Edens Expressway, I-94, and exit at Peterson eastbound. Go a mile east to Pulaski, turn right and go south to the first traffic light. Turn left at the light into the North Park Village complex. At the entrance is a stop sign and a guardhouse. When you come to a second stop sign, the administration building is the large building ahead and to your left. There is a free parking lot behind the building.

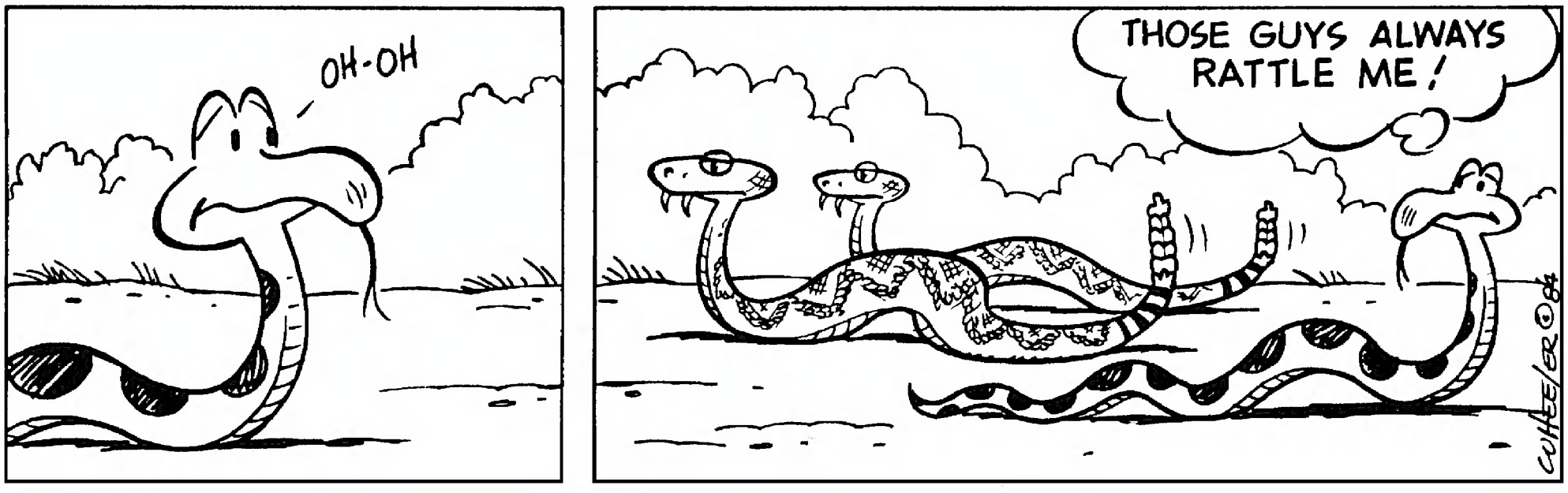
The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info call Lisa Koester, (773) 508-0034, or visit the CTC website: http://www.geocities.com/~chicagoturtle.

HERP OF THE MONTH

Each monthly meeting will showcase a different herp. CHS members are urged to bring one specimen of the "Herp of the Month" to be judged against the entries from other CHS members. Prizes will be awarded to the top three winners. Because of "Show & Tell" there will be no Herp of the Month competition in June. For July you are asked to bring your **most colorful herp**.

THE ADVENTURES OF SPOT



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